



Rehabilitation Robotics

The Sorcerers Apprentice ?

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Rehabilitation Robotics : The Sorcerers Apprentice

What are Rehabilitation Robots ?

Devices that help--

- Diagnose
- Treat
- Assist functional restoration



Why Do We Need Robots for Neurologic Injury ?

1. Economics of neurologic rehabilitation
2. Demographics- increasing prevalence of stroke
3. Treatment options limited in duration and intensity



Rehabilitation Robotics : The Sorcerers Apprentice

- Planar Robots- MIT manus
- Planar Robots- Reaching Guide
- Whole Arm Manipulator (WAM)
- Lokomat

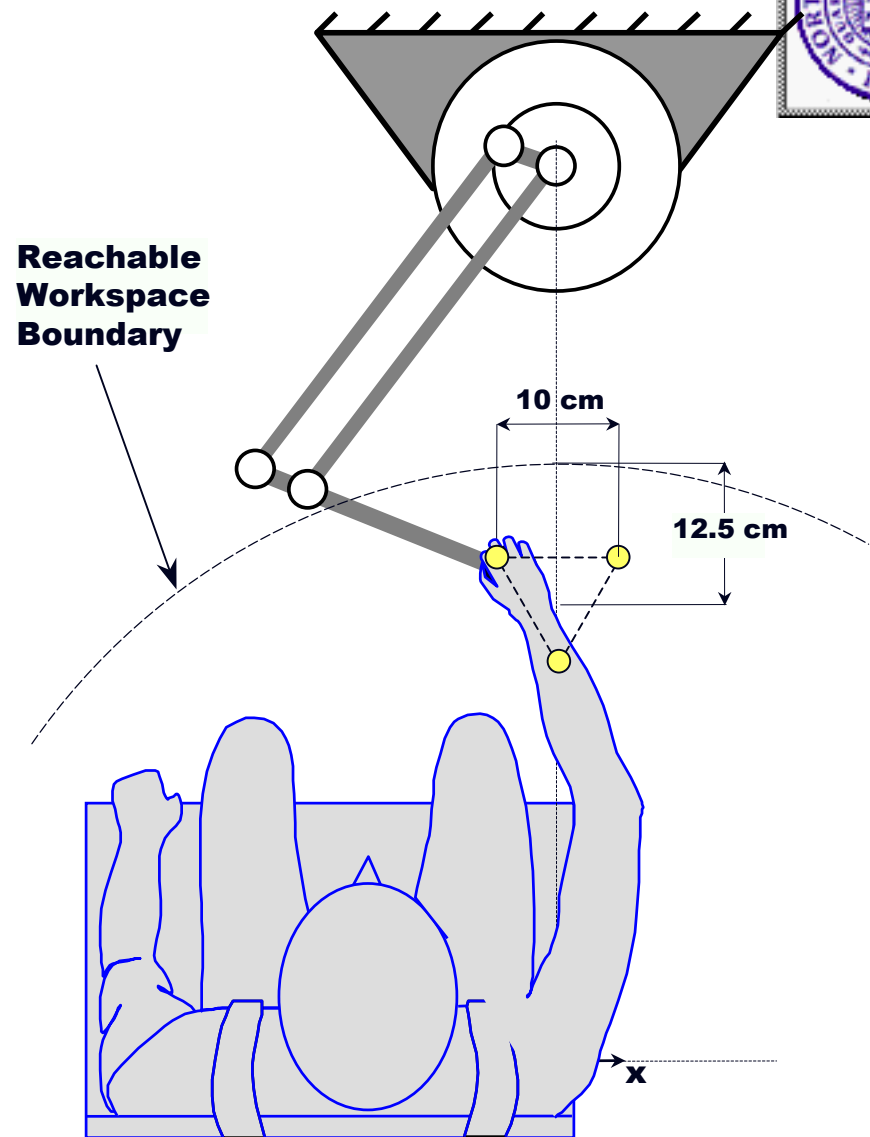
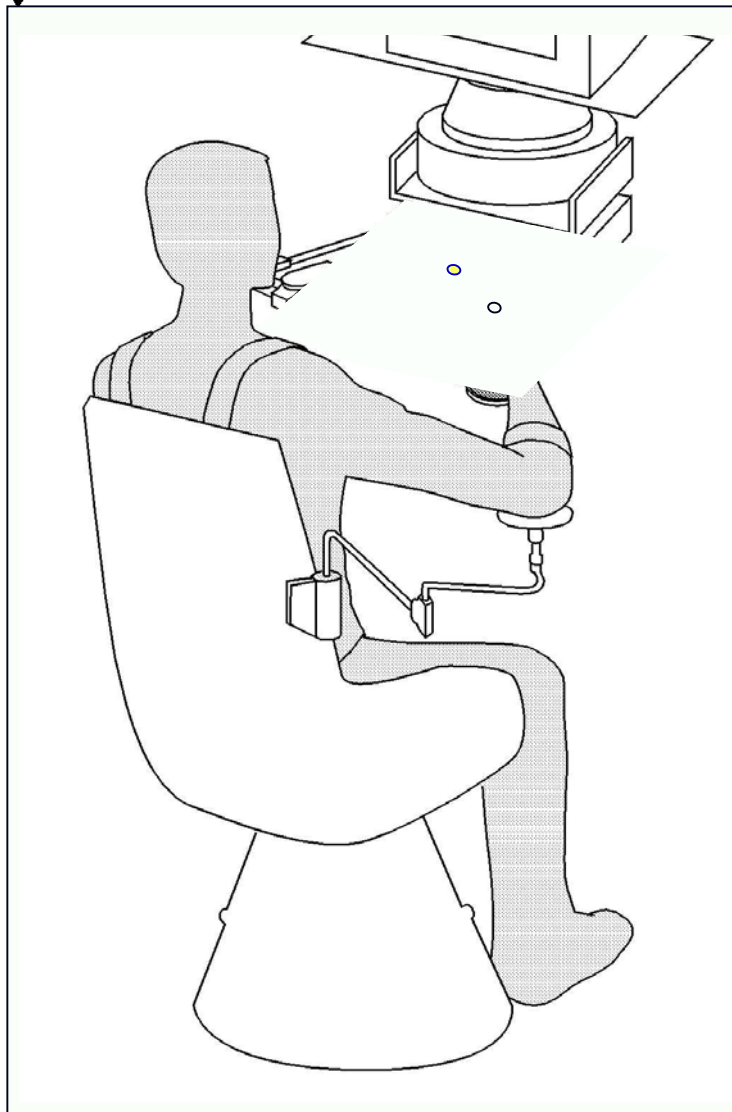


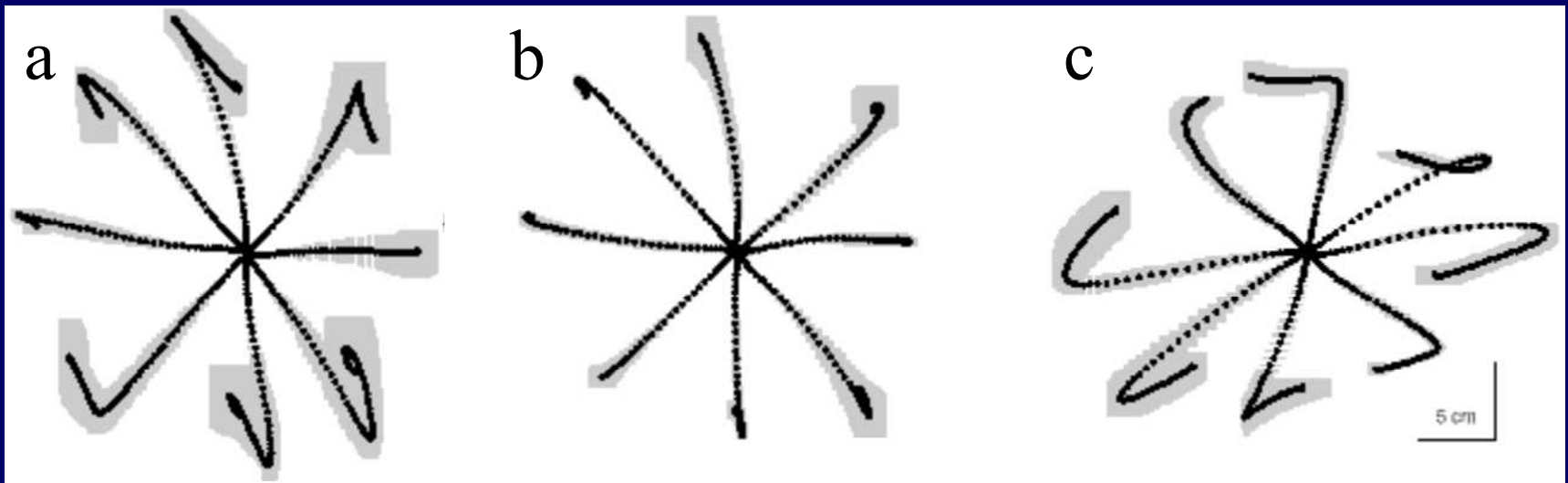
Rehabilitation Robots

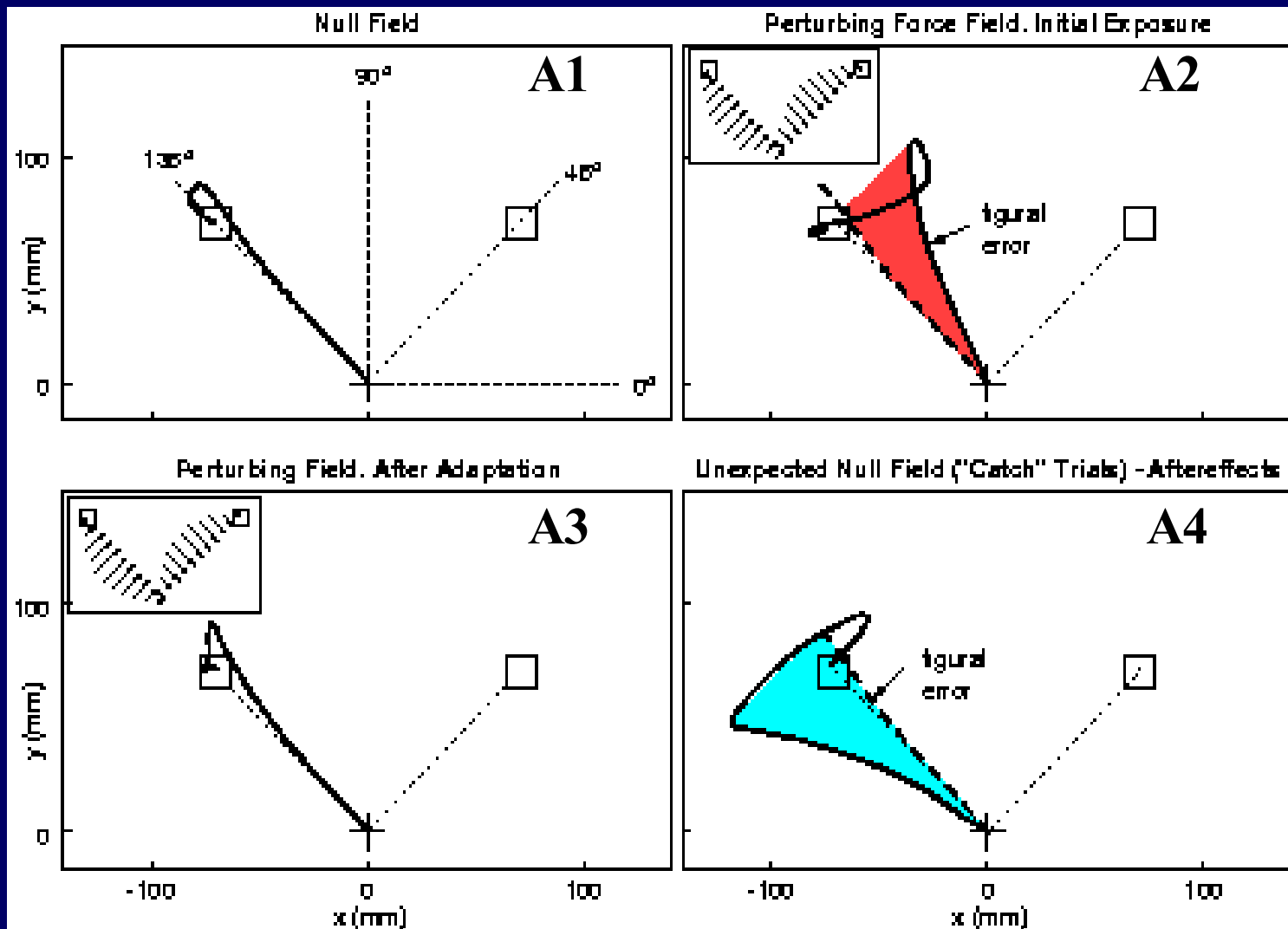


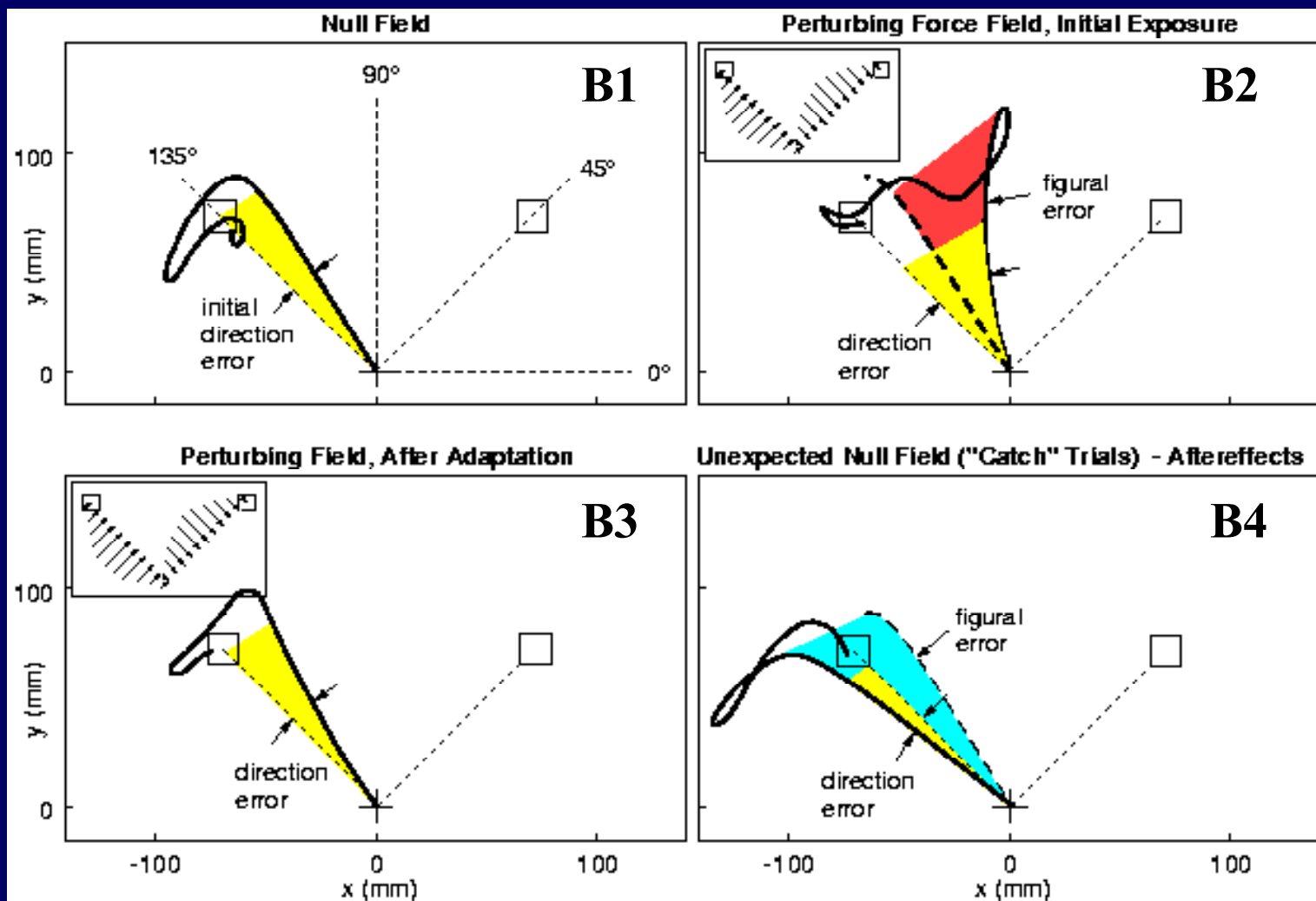
How should they be used ?

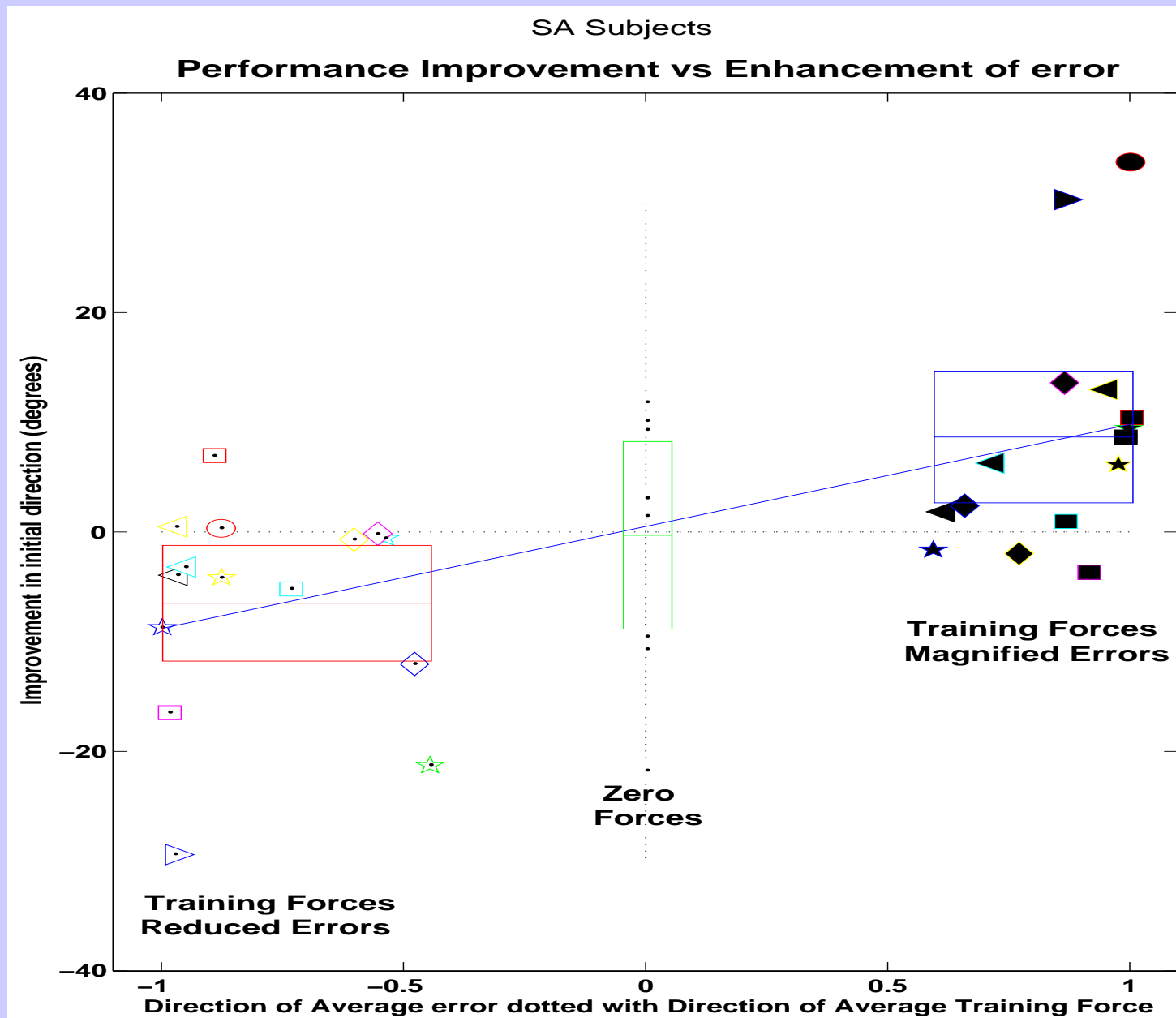
1. Maintain range of motion
2. Error reduction - trajectory training
3. Error magnification - force fields
4. Disrupt synergies by training differing joint torque patterns











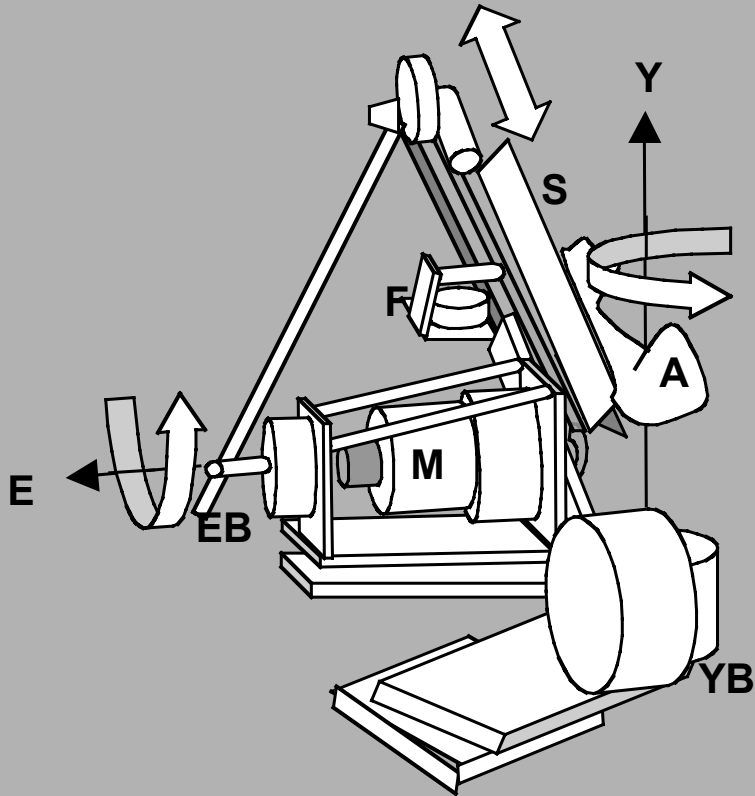


Robot Therapy for Force Training of the Upper Extremity in Chronic Hemiparetic Stroke:

Len Kahn, David Reinkensmeyer



Robotic Therapy for Force Training





WAM/Paris

A Robotic System for Upper extremity With An Augmented Reality Interface

Broad Project Aims

- Prolonged and intensive practice has a dramatic influence on recovery.
- To achieve significant practical applications in rehabilitation, human-interface robots must safely operate in three dimensions with a large workspace and an appropriately designed visual interface.

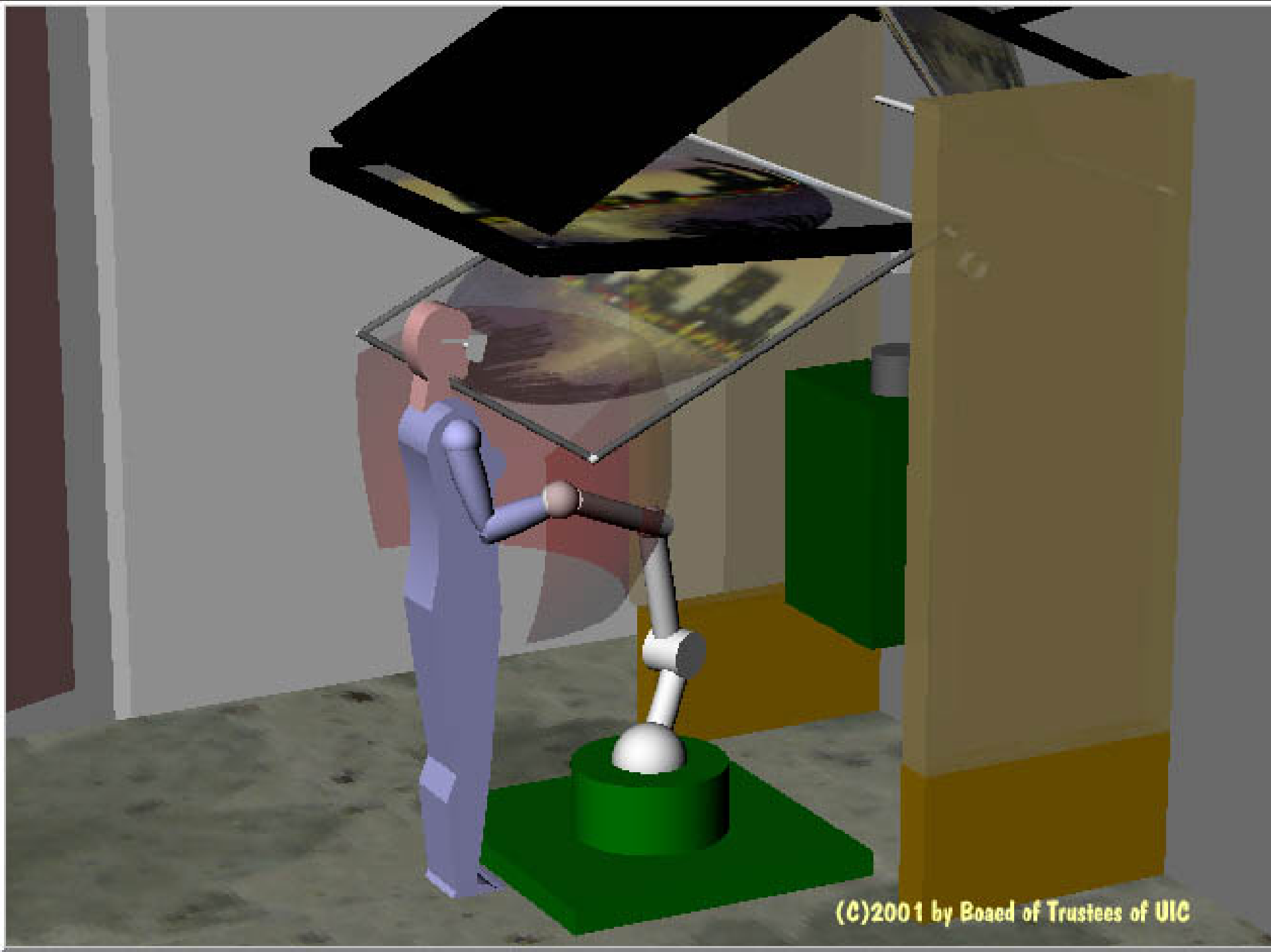
No current system has all of these features.



Augmented Reality Interface Cont.



- We need instrumentation that allows subjects to receive therapeutic forces while they view synthetic cues and feedback superimposed on the real world.
- A longitudinal study on chronic stroke survivors will test the system's ability to perform against conventional therapy.
- A panel of stroke survivors and clinicians will provide subjective and objective measures of the system's ability to restore function.





Home-Based, Telerehabilitation System for Improving Functional Hand and Arm Movement Recovery Following Stroke: Reinkensmeyer



The Lokomat:

**Gait Restoration in Hemiparetic Stroke
Patients using Goal-Directed
Robot-Assisted Treadmill Training**

**Joe Hidler Catholic University
George Hornby Rehab Inst of Chicago**



Gait Restoration in Hemiparetic Stroke



The specific aim of this study is:

To determine whether robot-assisted gait training with the Lokomat leads to higher functional returns in walking capability when compared to conventional rehabilitation.



Summary

Robotic rehabilitation is a promising approach that offers economic advantages, and can provide long-term intensive treatment.

We do not yet know how best to use these devices, and whether they will be accepted into the hospitals and clinics.